AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (Currently Amended) A Pprocess for surface activation and/or devulcanization of sulfur-vulcanized rubber particles comprising:

treating one or more sulfur-vulcanized ~~, in which to break the sulfur bridges and to reduce the sulfur, the~~ rubber particles ~~are treated~~ in a biotechnologically ~~manner in a medium~~ with:

bacteria selected from at least one of

(i) ___mesophilic anaerobic bacteria;

(ii) ___~~and/or~~ mesophilic optionally anaerobic bacteria; ~~and/or~~

(iii) ___mesophilic microaerophilic bacteria; ~~and/~~or

one or more enzyme systems of a selected ~~such~~ bacteria;

wherein one or more sulfur bridges are broken and an oxidation state of the sulfur is reduced;

wherein the treatment of rubber particles is carried out by any one or more of:

(i) a microbial process; or

(ii) an enzymatic process, wherein the enzymatic process is carried out by the enzyme system, preferably isolated by the bacteria; and

wherein the treatment is carried out at temperatures below 50° Celsius.

2. (New) The process as recited in claim 1, wherein at least one of:

i) the medium for treating the rubber particles comprises water, nutrients, a carbon source, and bacteria; or

ii) a concentration of the rubber particles in the medium is maintained below 35 wt-%.

3. (New) The process as recited in claim 1, further comprising intermixing the medium with an agitator to reduce the temperature and/or concentration gradients.

4. (New) The process as recited in claim 1, further comprising carrying out the treatment under one of anaerobic or microaerophilic conditions.

5. (New) The process as recited in claim 1, wherein the treatment is carried out at temperatures within an optimal temperature range for mesophilic bacteria of from about 33° C to about 37° C.

6. (New) The process as recited in claim 1, wherein the treatment is carried out at a pH value in the region of from about 5 to about 9.

7. (New) The process as recited in claim 1, wherein a residence time of the rubber particles in the medium is from about 4 to about 8 days.

8. (New) The process as recited in claim 1, wherein the bacteria are capable of sulfur respiration, and belong to one or more of the Desulfuromonas thiophila, Desulfuromonas palmitatis, Sulfurospirillum deleyianum, Desulfuromonas acetoxidans bacterial strains or a mixed population thereof.

9. (New) The process as recited in claim 1, wherein the rubber particles to be treated comprise any one or more of powdered rubber or rubber granulate, wherein the particle size of the powder or granulate is from about 0.1 mm to about 0.6 mm.

10. (New) The process as recited in claim 1, wherein the rubber particles to be treated comprise rubber particles made up of sulfur-vulcanized rubber or composites thereof.

11. (New) The process as recited in claim 1, wherein the rubber particles to be treated comprise rubber particles made of scrap rubber and/or waste rubber, such that the process reclaims the scrap and/or waste rubber.

12. (New) The process as recited in claim 1, wherein the rubber particles to be treated are produced in any one of:

i) a comminution process, such as a peeling process;

ii) a hot grinding process;

iii) a cold grinding process;

iv) a cryogenic grinding process; or

v) a wet grinding process;

wherein the temperature of the rubber particles remains lower than about 90° C to thereby substantially avoid thermooxidative degradation of the rubber particles.

13. (New) The process as recited in claim 1, wherein the surface activation and/or devulcanization is substantially restricted to the rubber particle surface and/or layers close to the surface that have a thickness of up to 300 nm, in order to substantially avoid altering the material properties of the main mass of the rubber particle material.

14. (New) The process as recited in claim 1, wherein the treatment of the rubber particles is carried out in a bioreactor.

15. (New) The process as recited in claim 16, wherein the addition of the rubber particles to be treated into the bioreactor and/or the removal of the rubber particles to be treated from the bioreactor is carried out in any of a:

i) continuous fashion;

ii) quasi-continuous fashion; or

iii) discontinuous fashion;

wherein, when removing the treated rubber particles from the bioreactor, substantially no amount of bacteria and/or medium containing enzymes for treating the rubber particles is discharged therewith or comes into contact with atmospheric oxygen, such as by sedimentation of the rubber particle material and its subsequent removal under anaerobic conditions.

16. (New) The process as recited in claim 1, wherein:

i) any sulfur bridges contained in the rubber particles are at least partially broken by the treatment; and

ii) the sulfur is transferred into one or more gas-forming reaction products that is at least quasi-continuously removed from the gas phase to avoid inhibition and/or toxification of the bacteria;

wherein the gas-forming reaction products comprise hydrogen sulfide.

17. (New) The process as recited in claim 1, further comprising:

washing the treated rubber particles with water after treatment to reduce salt loading; and

subsequently drying the washed, treated rubber particles at temperatures below 90° C.

18. (New) The process as recited in claim 1, further comprising using the rubber particles that are surface activated by means of the treatment to manufacture:

i) rubber products that are produced only from the treated surface activated rubber particles; or

ii) rubber products that are produced from the treated surface activated rubber particles and admixed virgin rubber.

19. (New) The process as recited in claim 1, further comprising using the rubber particles that are surface activated by means of the treatment to manufacture elastomer alloys, wherein the elastomer alloys are produced by phase coupling with plastics selected from the group consisting of Polypropylene (PP) and Polyurethane (PU).